REMARKS

In the Office Action[1], the Examiner rejected claims 8-11 and 13-17 under 35 U.S.C. § 112, first paragraph and rejected claims 1-7 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,453,727 to Shibasaki et al. ("Shibasaki").

By this amendment, Applicants have amended claim 8. Support for the amendments to claim 8 may be found in the specification at, for example, page 29, lines 5-10. Claims 1-11 and 13-30 are pending, of which claims 1-11 and 13-17 are under current examination, and claims 18-30 are withdrawn from consideration.

I. Rejection under 35 U.S.C. § 112, first paragraph

The Examiner rejected claims 8-11 and 13-17 under 35 U.S.C. § 112, first paragraph. Among other things, the Examiner asserted that the claims "[fail] to comply with the written description requirement." Office Action, page 2. Applicants have amended independent claim 8 to address the Examiner's concerns. Accordingly, Applicants request that the Examiner withdraw the rejection of independent claim 8, as well as to claims 9-11 and 13-17 that depend from claim 8.

II. Rejection under 35 U.S.C. § 103(a)

Applicants respectfully traverse the rejection of claims 1-7 under 35 U.S.C. § 103(a) as being unpatentable over Shibasaki. A *prima facie* case of obviousness has not been established.

A *prima facie* case of obviousness has not been established because, among other things, the prior art, taken alone or in combination, do not teach or suggest each

[1] The Office Action contains a number of statements reflecting characterizations of the related art and the claims. Regardless of whether any such statements is identified herein, Applicants decline to automatically subscribe to any statement of characterization in the Office Action.

and every element of Applicants' independent claim 1. In particular, Shibasaki does not teach or suggest, at least, a compound semiconductor stacked structure having "lattice constant differences between said active layer and said first and second compound semiconductor layers are set within a range of 0.2% to 0.9%" (emphasis added).

This limitation is significant.

In the present invention, variations in characteristics such as the electron mobility can be kept vary small because of the composition variations in Sb in the first and second compound semiconductor layers. Namely, the present invention, as claimed, provides that the lattice constant differences between an active layer and first and second compound semiconductor layers are set within a range of 0.2% to 0.9% and active layer is thicker than 35 nm and thinner than 70 nm.

The present invention is implemented to solve the conventional problems "if the lattice constants of the first and second compound semiconductor layers 12 and 14 are too large or too small with respect to the lattice constant of the active layer 13, the characteristics such as the electron mobility can vary greatly because of the composition variations in Sb in the first and second compound semiconductor layers 12 and 14." See specification, page 23, lines 10 to 16. With lattice constant differences between an active layer and first and second compound semiconductor layers set within a range of 0.2% to 0.9% and active layer is thicker than 35 nm and thinner than 70 nm, the variations in characteristics such as the electron mobility and sheet resistance can vary small because of the composition variations in Sb in the first and second compound semiconductor layers.

As for the lattice constants of these compound semiconductor crystals, since they depend on the element compositions of the layers according to Vegard's law, the compositions of the layers are determined such that the lattice constant differences between them become optimum. As shown Figure 3 of the specification, if the lattice constants of the first and second compound semiconductor layers 12 and 14 are too large or too small with respect to the lattice constant of the active layer 13, the characteristics such as the electron mobility can vary greatly because of the composition variations in Sb in the first and second compound semiconductor layers 12 and 14.

In the previous Amendment filed on May 23, 2007, Applicants argued that although Shibasaki may disclose lattice constant differences in the range of ±5% and ±2%, these ranges substantially exceed the claimed range of 0.2% to 0.9%. Therefore, Shibasaki does not teach the claimed range of "0.2% to 0.9%" with sufficient specificity to anticipate this feature of claim 1.

Though the Examiner now admits that Shibasaki "does not teach the lattice constant" (see Office Action, page 3), the Examiner alleges that Example 4 in Shibasaki shows a specific example of such a device that teaches the claimed "lattice constant difference." See Office Action, page 4. In particular, the Examiner asserts that this disclosed device includes an active layer comprised of InAs and having a lattice constant of 6.0584 Å, as well as first and second semiconductor layers comprised of $Al_{.8}Ga_{.2}As_{.16}Sb_{.84}$ and having a lattice constant of 6.0464 Å. See Office Action, page 4. Based on these values, the Examiner concludes the lattice constant difference between

the layers is 0.2%, which is within the claimed range of 0.2% - 0.9%. However, applications respectfully submit that this is not correct.

During an telephone call with the Examiner on March 1, 2007, the Examiner stated that the lattice constant for $Al_{.8}Ga_{.2}As_{.16}Sb_{.84}$ was extrapolated from Figure 1 of U.S. Patent No. 4,195,305 to Moon ("Moon"). However, according to Applicants, Figure 1 of Moon can not be used to accurately calculate the lattice constant value up to four significant figure as reported by the Examiner (i.e. 6.0464 Å), because Figure 1 is only accurate up to 1 significant figure. Instead, Applicants have calculated an accurate lattice constant value for $Al_{.8}Ga_{.2}As_{.16}Sb_{.84}$ using Vegard's law and lattice constants for the binary compounds (GaAs = 5.653 Å, AlAs = 5.662 Å, AlSb = 6.135 Å, and GaSb = 6.095 Å).[2] Based on this analysis, Applicants have calculated the lattice constant value for $Al_{.8}Ga_{.2}As_{.16}Sb_{.84}$ to be equal to 6.0521 Å. Using this value and the value for the lattice constant for the active layer (InAs) mentioned in Example 4 of Shibasaki (6.0584 Å), the lattice constant difference between the layers is about **0.01%**, which is outside the claimed range of "0.2% - 0.9%." Therefore, Shibasaki fails to teach, at least, that the "lattice constant differences between said active layer and said first and second compound semiconductor layers are set within a range of 0.2% to 0.9%," as recited in independent claim 1 (emphasis added).

Accordingly, the references of record do not establish a *prima facie* case of obviousness. In view of the scope and content of the prior art and the differences

[2] These values are very similar to those found publicly at http://www.siliconfareast.com/lattice_constants.htm, a copy of which is enclosed as Exhibit A.

between the claimed invention and the prior art, the claimed invention is allowable over Shibasaki.

In view of the above, the Examiner has neither properly determined the scope and content of the prior art nor properly ascertained the differences between the prior art and the invention of claim 1. Thus, the Examiner has failed to clearly articulate a reason why claims 1 or 8 would have been obvious to one of ordinary skill in the art in view of the prior art. Accordingly, a *prima facie* case of obviousness has not been established with respect to claim 1 and the rejection under 35 U.S.C. § 103(a) must be withdrawn. In addition, dependent claims 2-7 are also allowable at least due to their dependence from claim 1, and Applicants request the reconsideration and withdrawal of the rejections of these claims.

III. Conclusion

In view of the foregoing amendments and remarks, Applicants respectfully request reconsideration and reexamination of this application and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to our Deposit Account 06-0916.

Respectfully submitted,

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